

organ is practically one whole—one mass of protoplasm cut up into chambers which communicate with one another, and bounded by a membrane on the exterior. If, on the other hand, the communications between the protoplasm of neighbouring cells are only established after a complete septum has been formed, then it may or may not be that the above view holds, —so far as the continuity of the protoplasm of mature cells is concerned, it affords no conclusive proof against the very generally accepted idea that the plant consists of cell units aggregated into colonies, tissues, &c.

Turning for a moment to certain investigations which throw light on this matter from totally different directions, it will be seen that there is much to be said for the view lately stated by Sachs, and first hinted at by Hofmeister, that a much closer relation of cell to cell exists than can be well explained by the theory that a plant is a sort of cell republic, consisting of aggregated cell units.

Strasburger's well-known investigations on the process of cell division have led to the remarkable and startling result that the septum or partition-wall, formed when a cell divides, is in general a solid membrane built up by the aggregation of certain particles (microsomes) which become arranged into a plate (the cell-plate) at the equator of the dividing mass of protoplasm. These microsomes are conducted to this equator, and there mobilised by certain delicate fibrillæ in the protoplasm; these fibrillæ form the well-known spindle-like figure, and are continuous across the equator. If the microsomes travel along the fibrillæ from either side, and are fitted together between them, it seems difficult to doubt that the continuity of the protoplasm observed later simply depends upon the persistence of this primitive continuity, and such appears to be the case.

The proof that the primitively continuous fibrillæ remain continuous throughout does not yet exist however; and although it is so likely, it cannot be forgotten that protoplasm possesses a marvellous power of boring through and dissolving even adult cell-walls, as is evident in the exit of zoospores or the entrance of parasites through cell-walls, the formation of pollen-grains, &c.

But we have not yet exhausted the evidence for the view that the continuity of the protoplasm through the cell-walls of fully developed organs exists from the first.

The investigations of Strasburger, Schmitz, and others, on the protoplasm and nucleus of vegetable cells, have yielded the results that, in the first place, many cells believed to be devoid of nuclei really possess these structures, and often in enormous numbers; and, secondly, that many cases of division occur where a delicate cell-wall is formed in the equatorial plane between the two dividing nuclei, but only to disappear later. In many other cases no recognisable septum is formed at all. The internodes of *Chara* and the zoosporangia of *Achlya* may be cited as examples. In *Vaucheria*, *Caulerpa*, &c., again, we have plants each of which is practically a single cell with numerous nuclei: these nuclei divide as the cell grows, but no cell-walls are formed—the plant remains "unicellular."

If in such cases a septum were formed each time a nucleus divides, the protoplasm of the *Vaucheria*, *Caulerpa*, &c., would become divided up into cells; and if the septum in each division were incomplete only in so far that it allowed the fibrillæ of protoplasm which carry and arrange the microsomes to remain continuous through it, we should have essentially the condition of things demonstrated by Hanstein, Tangl, and especially by Gardiner.

But it would in such a case be imperative to express the facts in accordance with the primitive state of affairs—the protoplasm of the hypothetical plant would be cut up into compartments or cells, communicating throughout. Now it is just this view which Sachs has lately brought forward so clearly and ably. A multicellular plant does not grow and become complex because it consists of numerous aggregated cells which increase and divide; but it becomes multicellular because it grows larger, and partition walls are placed in the mass partly for mechanical purposes, partly to insure physiological distribution of labour.

It is impossible, Sachs thinks, to hold the view that *Vaucheria*, *Caulerpa*, and such plants have arisen by the degradation of ancestors which formed cell-walls. It is also suggestive that the nuclei in such "unicellular" plants are more closely packed at the growing apex of the vesicle; for we may thus understand how the growing point of an organ with a single large apical cell only differs in degree from one with numerous small apical cells.

The consideration of all these matters leads to the conviction that the cell-theory so long taught may have to be modified even

more than it has been during the last ten or twelve years; and that once more we are being driven back to that centre of all biological phenomena—the properties of protoplasm, multiple and various in degree and in kind as they are.

In conclusion, we cannot omit drawing attention to the improved and refined methods employed by the careful and skilled botanists of the younger school; and it is to be hoped that those who pass over the ground again will be at least equally well equipped. It is not only reagents that are necessary in such matters—critical power is indispensable as well as pure chemicals, as any one may convince himself by the study of the recent memoirs referred to, including the careful papers from Gardiner's hands. One more point may well be insisted upon here: the exhaustive study of a series of facts invariably brings them at length into relation with other facts, and where neither series is alone sufficient to base a scientific induction upon, converging groups of observations may result in the establishment of very important generalisations, leading to the recognition of still larger consequences. There can be no question of the intrinsic value of the observations on the continuity of protoplasm, apart from the information they give in connection with physiological matters; but it is certain that they gain immensely in scientific importance when looked at in the light afforded by recent discoveries as to the behaviour of the nucleus and protoplasm in cell division.

### NATIONAL WORK AND HEALTH

THE work of the International Juries was formally inaugurated at the Health Exhibition on Tuesday by H.R.H. the Prince of Wales. The principal address was given by Sir James Paget, who chose as his subject "The Relation between National Health and Work," especially as it may be shown in a few of the many examples of the quantity of work which is lost to the nation either through sickness or through deaths occurring before the close of what may fairly be reckoned as the working time of life.

Sir James Paget went on to say:—I think it may be made clear that this loss is so great that the consideration of it should add largely to the motives by which all people may be urged to the remedy of whatever unwholesome conditions they may live in. It is a subject which is often in the minds of the real students of the public health, but the public itself is far too little occupied with it.

In view of the national health and welfare, the pattern healthy man is one who lives long and vigorously; who in every part of his life, wherever and whatever it may be, does the largest amount of the best work that he can, and, when he dies, leaves healthy offspring. And we may regard that as the healthiest nation which produces, for the longest time and in proportion to its population, the largest number of such men as this, and which, in proportion to its natural and accumulated resources, can show the largest amount and greatest variety of good work.

Here let me insert, as an interpretation clause, that in all this and what is to follow the word "man" means also "woman," and "he" also means "she"; and that when I speak of work I mean not only manual or other muscular work, but work of whatever kind that can be regarded as a healthy part of the whole economy of the national life. And I shall take it for granted that a large portion of all national welfare is dependent on the work which the population can constantly be doing; or, if I may so express it, that the greater part of the national wealth is the income from the work which is the outcome from the national health.

It is a common expression that we do not know the value of a thing till we have lost it; and this may be applied to the losses of work which are due to the losses of national health. There are very few cases in which these can be estimated with any appearance of accuracy; but I am helped to the best within our present reach by Mr. Sutton, the Actuary to the Registry of Friendly Societies. In his office are the returns, for many years past, of the sickness and mortality among the members of a very large number of these Societies; and, among other things, there is recorded the number of days on which each member, when "off work" on account of sickness, received money from his Society. Hence Mr. Sutton can estimate, and this he has been so good as to do for me, the average number of days' sickness and consequent loss of work among several hundred thousands of the workmen and others who are members of these Societies. From the entire mass of these returns, he deduces that the

average number of days' sickness, per member, per annum, is very nearly a week and a half; and this agrees, generally, with the estimates made in other Societies by Mr. Neison and others. But the averages thus obtained include the cases of members of all ages, and among them many cases of chronic sickness and inability to work during old age. In order, therefore, to get a better idea of the actual annual loss of work through sickness, he has taken the published experience of the members of the large group of Friendly Societies known as the Manchester Unity of Odd Fellows; and then, on the fair assumption that the rates of sickness of the whole population during the working years of life would not be far different, he has calculated the following tables, showing the average annual rates of sickness of each person, enumerated in the Census of 1881, as living between the ages of 15 and 65:—

| Ages.                    | Number of Males<br>Census of 1881<br>(England and<br>Wales). | Weeks' Sickness<br>per annum, accord-<br>ing to the ex-<br>perience of the<br>Manchester<br>Unity. | Average<br>Sickness<br>per indi-<br>vidual per<br>annum (in<br>weeks). |
|--------------------------|--|--|--|
| 15-20 ...                | 1,268,269 ..   | 844,428 ...  | '666   |
| 20-25 ...                | 1,112,354 ...  | 820,183 ...  | '737   |
| 25-45 ...                | 3,239,432 ...  | 3,224,134 ...  | '995   |
| 45-65 ...                | 1,755,819 ...  | 4,803,760 ...  | 2'736  |
| All ages: from 15-65 ... | 7,375,874 ...  | 9,692,505 ...  | 1'314  |

| Ages.                   | Number of Fe-<br>males: Census of<br>1881. | Weeks' Sickness<br>per annum, accord-<br>ing to the ex-<br>perience of the<br>Manchester<br>Unity. | Average<br>Sickness<br>per indi-<br>vidual per<br>annum (in<br>weeks). |
|-------------------------|--|--|--|
| 15-20 ...               | 1,278,963 ...                              | 851,701 ...  | '666   |
| 20-25 ...               | 1,215,872 ...                              | 896,685 ...  | '737   |
| 25-45 ...               | 3,494,782 ...                              | 3,476,146 ...  | '995   |
| 45-65 ...               | 1,951,713 ...                              | 5,368,229 ...  | 2'751  |
| All ages from 15-65 ... | 7,941,330 ...                              | 10,592,761 ...   | 1'334  |

Briefly, it appears from these tables that the average time of sickness among the male population during the working years is a small fraction more than 9 days each in each year—and that among the female population it is yet a small fraction more; the excess arising from the larger proportion of persons at the later ages. The result is that among males there is a loss of 9,692,505 weeks' work in every year, and among females a loss of 10,592,761 weeks. Thus we may believe that our whole population between 15 and 65 years old do, in each year, 20,000,000 weeks' work less than they might do if it were not for sickness. The estimate is so large that it must, on first thoughts, seem improbable; but on fair consideration I believe it will not seem so. For the members of the Manchester Unity who are in the working time of life the reckoning is certainly true, and it is founded on the experience of between 300,000 and 400,000 members. In respect of health they may represent the whole population at least as well as any group that could be taken. They are not very strictly selected, they are not picked lives, yet they are such as are able, when they are in health, to earn good wages or good salaries, and, as their prudence in joining this association shows, they are comparatively thrifty and careful persons. They do not, at all events, include many habitual drunkards, cripples, or utter invalids, or those who, through natural feebleness or early disease, or mere profligacy, cannot earn enough to become members or maintain themselves in membership. Neither do they include many of the insane or imbecile and idiotic, of whom there are, in our population, nearly 70,000 doing no work, and losing not less than 3,500,000 of weeks' work in the year.

It would be tedious to tell the grounds on which the estimate may be deemed too high, for just as many and as good could be told on which it might be deemed too low. And it is rather more than confirmed by some estimates of the annual sickness in other and very different groups of persons.

In the Army, at home, the average number of days' sickness in each year is, for each soldier, about 17; and as the number of the troops in the United Kingdom is more than 80,000, we have here a loss of about 200,000 weeks' service in each year.

In the Navy, on the home stations, the average number of days' sickness in each year has been in the last five years for each man nearly 16; so that for the total of about 20,000 men there is a loss of 45,000 weeks' service in each year.

The amount of sickness in the services thus appears much

higher than in the Friendly Societies. This is due, in great part, to the fact that a soldier or a sailor is often put off duty for a day or two for much less illness than that for which a civilian would "go on his club." Still, the one estimate may confirm the other; for the sickness in the Army and Navy is that of picked men, who were selected for the services as being of sound constitution, and who are in what should be the best working years of life: and if it includes many cases of sickness for only a day or two, it excludes nearly all cases of more than a few months, such as make up a heavy proportion of the average sickness in the Friendly Societies and in the general population.

And I may add that the estimate from these Societies, that 9 days in the year may justly be thought a fair estimate of the working time lost by sickness, is confirmed by the records of sickness among the 10,000 members of the Metropolitan Police Force; for among these, including cases of long illness such as are also in the Societies, the average is more than 9 days in the year.

I think, then, that we cannot escape from the reasons to believe that we lose in England and Wales, every year, in consequence of sickness, 20,000,000 of weeks' work; or, say, as much work as 20,000,000 of healthy people would do in a week.

The number is not easily grasped by the mind. It is equal to about one-fortieth part of the work done in the year by the whole population between 15 and 65 years old. Or, try to think of it in money. Rather more than half of it is lost by those whom the Registrar-General names the domestic, the agricultural, and the industrial classes. These are rather more than seven millions and a half in number, and they lose about 11,000,000 of weeks; say, for easy reckoning, at a pound a week; and here is a loss of 11,000,000l. sterling from what should be the annual wealth of the country. For the other classes, who are estimated as losing the other 9,000,000 weeks' work, it would be hard and unfair to make a guess at the loss in any known coin; for these include our great merchants, our judges and lawyers, and medical men, our statesmen and chief legislators; they include our poets, and writers of all kinds, musicians, painters, and philosophers; and our Princes, who certainly do more for the wealth and welfare of the country than can be told in money.

Before I speak of any other losses of work or of wealth due to sickness, permit me, as in parenthesis, to point out to you how very imperfectly their losses are told or even suggested by our bills of mortality. These, on which almost alone we have to rely for knowing the national health—these tell the losses of life; and more than misery enough they tell of; but to estimate rightly the misery of sickness and the losses of all but life that are due to it, we need a far more complete record than these can give.

Take, for example, such a disease as typhoid fever—that which Mr. Huxley has rightly called the scourge and the disgrace of our country. It has of late destroyed in England and Wales, among persons in the working time of life, nearly 4000 in the year. Its mortality is about 15 per cent., so that if in any year 4000 die of it, about 23,000 recover from it. Of these the average length of illness is, on the authority of Dr. Broadbent, about ten weeks. Here, therefore, from one disease alone, and that preventable, we have an annual loss of 230,000 weeks' work, without reckoning what is lost with those who die. And the same may be said of nearly all the diseases that are most prominent in the bills of mortality. The record of deaths, sad as it is, tells but a small part of the losses of happiness and welfare that are due to sickness. It is as if, in a great war, we should have a regular return of the numbers killed, but none of the numbers sick and wounded, though these, more than the killed, may determine the issue of the war.

Let me now tell of another loss of work and of money through sickness and early death. In all the estimates I have yet referred to, no account is taken of those who are ill or die before they are 15 years old. They are not reckoned as in the working-time of life, though in some classes many thousands of them are. [In the domestic, agricultural, and industrial classes of the Registrar-General nearly half a million of them are included.] And yet the losses of work due to sickness among children must be very large. Consider the time which might be spent in good productive work, if it were not spent in taking care of them while they are ill. Consider, too, the number of those who, through disease in childhood, are made more susceptible of disease in later life, or are crippled, or in some way permanently damaged; such as those who become deaf in scarlet

fever, or deformed in scrofula or rickets, or feeble and constantly invalid, so that they are never fit for more than half work or work which is only half well done. These losses cannot be counted, but they must be large; and there are others more nearly within reckoning; the losses, namely, which are due to the deaths of those who die young. It may justly be said that all that they have cost during their lives is so much money sunk; so much capital invested and lost. If they had lived to work, their earnings would have been more than sufficient to repay it; but they have died, and their cost is gone without return. The mortality of children under 15 in 1882 was nearly a quarter of a million: what have they cost? If you say only 8*l*. a piece, there are more than 2,000,000*l*. sterling thus lost every year. But they have cost much more than this, and much more still is lost by the loss of the work they might have lived to do.

I will add only one more illustration of these losses, which is always suggested by looking at tables of mortality. The deaths of persons between 25 and 45 years old, that is during what may be deemed the 20 best working years of life, are annually between 60,000 and 70,000; in 1882 they were 66,000. Think, now, of the work lost by these deaths; and of how much of it might have been saved by better sanitary provisions. If one looks at the causes of their deaths, it is certain that many might have been prevented, or, at least, deferred. Say that they might have lived an average of 2 years more; and we should have had in this year and last an increase of work equivalent to that of at least 6,000,000 weeks; as much, in other words, as 6,000,000 people could do in one week.

More instances of losses of work by sickness and premature death might easily be given, but not easily listened to in this huge hall. Let these suffice to show something of our enormous annual loss, not only of personal and domestic happiness—that is past imagining—but of national power and wealth. Surely we ought to strive more against it.

But, some may ask, can these things be prevented? are they not inevitable consequences of the manner of life in which we choose or are compelled to live? No; certainly they are not. No one who lives among the sick can doubt that a very large proportion of the sickness and the loss of work which he sees might have been prevented; or can doubt that, in every succeeding generation, more may be averted, if only all men will strive that it may be so.

Let me enumerate some of the chief sources of the waste as they appear to one's self in practice, or as one looks down a table of mortality.

Of the infectious fevers, small-pox might be rendered nearly harmless by complete and careful vaccination. Typhus and typhoid, scarlet fever and measles, might, with proper guards against infection, be confined within very narrow limits. So, probably, might whooping-cough and diphtheria.

Of the special diseases of artisans there are very few of which the causes might not be almost wholly set aside. Of the accidents to which they are especially liable the greater part, by far, are due to carelessness.

Of the diseases due to bad food and mere filth; to intemperance; to immorality; in so far as these are self-induced, they might, by self-control and virtue, be excluded. And with these, scrofula, rickets, scurvy, and all the widespread defects related to them, might be greatly diminished.

It can only be a guess, but I am sure it is not a reckless one, if I say that of all the losses of work of which I have spoken, of all the millions of weeks sadly spent and sadly wasted, a fourth part might have been saved, and that, henceforth, if people will have it so, a still larger proportion may be saved.

We may become the more sure of what may be done by looking at what has been done already. Let me show some of it; it will be a relief to see something of the brighter side of this picture.

In a remarkable paper lately read before the Statistical Society, Dr. Longstaff says:—"One of the most striking facts of the day, from the statistician's point of view, is the remarkably low death-rate that has prevailed in this country during the last eight years." In these years the annual death-rate has been less than in the previous eight years, in the proportion of two deaths to every 1000 persons living. The average annual number of deaths has been 50,000 less in the last than in the previous eight years. Doubtless many things have contributed to this grand result, and it is not possible to say how much is due to each of them; but it would be unreasonable to doubt that the chief

good influence has been in all the improved means for the care of health which recent years have produced. This is made nearly certain by the fact that the largest gains of life have been in the diminution of the deaths from fever, and of the deaths in children under 15 years old; for these are the very classes in which good sanitary measures would have most influence.

The annual number of deaths from typhus, typhoid, and the unnamed fevers, has been about 11,000 less than it was about 20 years ago. The annual number of deaths of children under 5 years old has been about 22,000 less than it was; and that of children between 5 and 15 has been upwards of 8,000 less.

These are large results, and though they tell of only deaths, yet they bear on the chief subject I have brought before you—the working power of the nation; for, however much of the average we might assign to improved methods of medical treatment of fever, yet the diminished number of deaths means a very large diminution in the total number of cases. The deaths during the working years of life were 6,500 less; and, this being so, we may hold that, if the average mortality was, say, 25 per cent., the diminution in the total number of cases must have been at least 25,000; and if we may believe, as before, that each of the 6 involved ten weeks of sickness, we have, in these fevers alone, a clear saving of 185,000 weeks' work in every year.

And so with the diminution of the mortality among children, there must have been a greater diminution in the number of costly and work-wasting illnesses, and a large saving of money that would otherwise have been sunk. And not only so: but many of the children saved in the last eight years will become bread-winners or care-keepers; and who can tell what some of them will become? or what the world would have lost if it had lost them?

Let me add only one more reckoning. In a paper last year, at the Statistical Society, Mr. Noel Humphreys said "that if the English death-rate should continue at the low average of the five years 1876-80, the mean duration of male life in this country would be increased by two years, and that of female life by no less than 3*1*/<sub>4</sub> years as compared with the English Life-table." And he showed further that "among males 70 per cent. and among females 65 per cent. of this increased life would be lived between the ages of 20 and 60 years, or during the most useful period."

I should like to be able to tell the value in working-power of such an addition to our lives. It is equal to an addition of more than 4 per cent. to the annual value of all the industry, mental and material, of the country.

But some will say—admitting that it is desirable, seeing how keen the struggle for maintenance already is, can more than this be done? and the answer may be and must be, much more. In this, as in every case of the kind, every fruit of knowledge brings us within reach of something better. While men are exercising the knowledge they possess, they may be always gaining more. This Exhibition has scores of things which are better helps to national health than those of the same kind which we had twenty years ago, and with which the gains already made were won. If I were not in near official relation with the jurors I would name some of them: there are truly splendid works among them.

But do not let me seem to disparage the past in praising the present. It is difficult to speak with gratitude enough of what has been done, even though we may now see ways to the yet better.

Any one who has studied the sources of disease during the last thirty years can tell how and where it has been diminished. There is less from intemperance, less from immorality; we have better, cheaper, and more various food; far more and cheaper clothing; far more and healthier recreations. We have, on the whole, better houses and better drains; better water and air, and better ways of using them. The care and skill with which the sick are treated in hospitals, infirmaries, and even in private houses, are far greater than they were; the improvement and extension of nursing are more than can be described; the care which the rich bestow on the poor, whom they visit in their own homes, is every day saving health and life; and, even more effectual than any of these, is the work done by the medical officers of health and all the sanitary authorities now active and influential in every part of the Kingdom.

Good as all this work has been, we may be sure it may become better. The forces which have impelled it may still be relied on. We need not fear that charity will become cool, or

philanthropy inactive, or that the hatred of evil will become indifference. Science will not cease to search for knowledge, or to make it useful when she can; we shall not see less than we do now, and here, of the good results of enterprise and rivalry, and of the sense of duty and the sorrow for shame that there should be evil in the land.

What more, then, it may be asked, is wanted? I answer, that which I have tried to stir: a larger and more practical recognition of the value and happiness of good national health; a wider study and practice of all the methods of promoting it; or, at least, a more ready and liberal help to those who are striving to promote it. In one sentence, we want the complete fulfilment of the design of this Exhibition, with all the means towards health and knowledge that are shown in it, and with its handbooks, lectures, conferences, and the verdicts of its juries.

We want more ambition for renown in health. I should like to see a personal ambition for renown in health as keen as is that for bravery, or for beauty, or for success in our athletic games and field-sports. I wish there were such an ambition for the most perfect national health as there is for national renown in war, or in art or commerce. And let me end soon by briefly saying what I think such health should be.

I spoke of the pattern healthy man as one who can do his work vigorously wherever and whatever it may be. The union of strength with a comparative indifference to the external conditions of life, and a ready self-adjustment to their changes, is a distinctive characteristic of the best health. He should not be deemed thoroughly healthy who is made better or worse, more or less fit for work, by every change of weather or of food; nor he who, in order that he may do his work, is bound to exact rules of living. It is good to observe rules, and to some they are absolutely necessary, but it is better to need none but those of moderation, and, observing these, to be able and willing to live and work hard in the widest variations of food, clothing, and all the other sustentances of life.

And this, which is a sign of the best personal health, is essential to the best national health. For in a great nation, distributed among its people, there should be both muscular and mental powers suited to the greatest possible variety of work. No form or depth of knowledge should be beyond the attainment of some among them; no art should be beyond its reach; it should be excellent in every form of work. And, that its various powers may have free exercise and influence in the world, it must have, besides, distributed among its people, abilities to live healthily wherever work must be or can be done.

Herein is the essential bond between health and education; herein is one of the motives for the combination of the two within the purpose of this one Exhibition; I do not know whether health or knowledge contributes most to the prosperity of a nation; but no nation can prosper which does not equally promote both: they should be deemed twin forces, for either of them without the other has only half the power for good that it should have.

It is said, whether as fact or fable, that the pursuit of science and of all the higher learning followed on the first exercise of the humanity which spared the lives of sick and weakly children; for that these children being allowed to live, though unfit for war or self-maintenance, became thinkers and inventors. But learning is not now dependent upon invalids; minds are not the better now for having to work in feeble bodies; each nation needs for its full international influence both health and knowledge, and such various and variable health that there should be few places on earth or water in which some of its people cannot live, and multiply, and be prosperous.

If, therefore, we or any other people are to continue ambitious for the extension of that higher mental power of which we boast, or for the success of the bold spirit of enterprise with which we seek to replenish the earth and subdue it; if we desire that the lessons of Christianity and of true civilisation should be spread over the world, we must strive for an abundance of this national health, tough, pliant, and elastic, ready and fit for any good work anywhere.

#### UNIVERSITY AND EDUCATIONAL INTELLIGENCE

CAMBRIDGE.—The Senior Wrangler, Mr. W. F. Sheppard, scholar of Trinity College, is a native of Australia; the Second Wrangler, Mr. W. P. Workman, also a scholar of Trinity, is the son of a Wesleyan minister.

The Natural Sciences Tripos, Part 1, contains the names of fifty-three men, of whom thirteen are placed in the first class; in addition six are allowed an ordinary degree, and six are excused the general examination. Two ladies attained a first class, four a second, and one a third.

In the Natural Sciences Tripos, Part 2, the first class includes the names of Messrs. Adami (Physiology) Christ's College; Chree (Physics), King's; Green (Botany, Physiology), Trinity; Head (Physiology), Trinity; Laurie (Chemistry), King's; Phillips (Botany), St. John's; Shipley (Zoology), Christ's; and Threlfall (Chemistry, Physics), Caius. The subjects mentioned are those for distinction in which the candidates are placed in the first class.

Mr. C. Potter will give lectures on Systematic Botany with field excursions and practical work, in the long vacation, beginning July 8.

#### SOCIETIES AND ACADEMIES

##### LONDON

**Mathematical Society**, June 12.—Prof. Henrici, F.R.S., president, in the chair.—Mr. G. S. Ely, Fellow of the Johns Hopkins University, Baltimore, was elected a member.—The chairman announced that the Council had awarded the first De Morgan gold medal to Prof. Cayley, F.R.S.—A note on the induction of electric currents in a cylinder placed across the lines of magnetic force, by Prof. H. Lamb, was read in abstract.—Mr. J. Hammond gave some results of a paper which is shortly to appear in the *American Journal of Mathematics*.

**Linnean Society**, June 5.—Wm. Carruthers, F.R.S., vice-president, in the chair.—Messrs. J. Starkie Gardner, F.G.S., and J. H. Leech were elected Fellows of the Society.—Mr. J. Harris Stone exhibited and made remarks on specimens and photographs, viz. portion of the wood and of a remarkable wart (as large as a cocoa-nut) from the famous dragon-tree, *Dracena draco*, of the Canaries; photograph of the young dragon-tree planted by the Marquesa de Sawyal, and now growing on the site of the old celebrated tree of Oratova; photograph of the dragon-tree of Icod-de-los-Vinos in Teneriffe; and a photograph of the Peak of Teneriffe, showing how the "Retana" grows on the Cañadas.—There was shown, on behalf of Mr. R. Morton Middleton, a small branch of *Cotoneaster microphylla* grown at Castle Eden, Co. Durham, and a good example of fasciation in this plant.—Dr. R. C. A. Prior afterwards drew attention to specimens of the rare *Potentilla rupestris* from Craig Breidhin, Montgomeryshire, and of *Rumex sanguineus*, from the neighbourhood of Bristol, both freshly gathered by Mr. T. Bruges Flower, F.L.S.—A paper by Mr. G. Claridge Druce was read, in which he describes a new variety of *Melampyrum pratense*, L., and which he suggests should be known as var. *hians*.—Prof. J. Martin Duncan read a paper on a new genus of recent Fungida allied to the fossil form *Micrabacia*; the genus being based on a specimen of coral obtained from shallow water in the Korean Sea.—A communication was made by Mr. Arthur R. Hunt, on the influence of wave-currents on the fauna inhabiting shallow seas. The author refers to various physical data, among others quoting Prof. Stokes and Mr. T. Stevenson, the latter stating that a current of 0.6819 of a mile per hour will carry forwards fine gravel, and that of 1.3638 roll along pebbles an inch in diameter. From this and other facts Mr. Hunt argues that wave-currents do materially influence the marine fauna inhabiting shallow water, not only those of the tidal strand, but likewise those inhabiting the deeper sea-bottom. He adduces instances of animals living among or on rocks, and of those frequenting sand or other deposits, enumerating species of star-fish, mollusks, shrimps, crabs, and fish. He says that even the flat-fishes (Pleuronectidae) seem to have changed their original forms and habits for the purpose of being able to live in shallow waters agitated by waves. Referring more particularly to species of *Cardium*, he endeavours to show how, under the influence of wave-currents, the variation of species may be promoted and even their local extinction brought about.—A paper was read, on the Longicorn Beetles of Japan, by Mr. H. W. Bates. In a former paper (in 1873), on the same subject, the author treated of 107 species, but now adds many new genera and 129 more species, or a total of 236 specific forms as at present known to belong to the Japanese fauna. This great accession is due to the later collections of Mr. Geo. Lewis, who made a second